

FAN MOTOR STRUCTURE

BACKGROUND OF THE INVENTION

(a) Field of the invention

- 5 [0001] The invention relates to a fan motor structure and, more particularly, to a fan motor structure capable of enhancing the connection strength between a fan hub and a shaft.

(b) Description of the Related Art

- 10 [0002] A fan hub is liable to fall off if the connection strength between the fan hub and the shaft is not high enough to withstand the continuous vibrations during long periods of operation.

- 15 [0003] A cross-sectional view of a conventional fan motor structure 100 is shown in FIG. 1. Referring to FIG. 1, when the shaft 102 is connected to the fan hub 104, the area of the contact surface P between the shaft 102 and the fan hub 104 determines the magnitude of the connection strength between them; more specifically, the latter increases as the former does.

- 20 [0004] Nowadays, designers continually make an effort to reduce the size of electrical products. Under these circumstances, a fan motor structure is designed to reduce its overall thickness to meet such requirements when being applied to thin-size electrical products. However, because the thickness of the bearing 106 cannot be further reduced and a predetermined clearance between the bearing seat 108 and the fan hub 104 must be maintained after assembly, the length of the contact surface P in the axial direction of the fan motor structure 100 must be shortened to meet the aforesaid requirement. Thus, sufficient connection strength between the shaft 102 and the fan hub 104 cannot be provided.

BRIEF SUMMARY OF THE INVENTION

- [0005] An object of the invention is to provide a fan motor structure capable of enhancing the connection strength between a fan hub and a shaft.

- 30 [0006] According to the design of the invention, a fan motor structure includes a fan base, a bearing assembly, a fan hub and a shaft. The fan hub is formed with an extrusion protruding from its top planar surface, and the shaft is fit into the bearing assembly and connected to the fan hub. The shaft has one end protruding from the top planar surface of the fan hub to form an extension portion enclosed by the

extrusion of the fan hub.

[0007] Through the invention, since the fan hub is formed with an extrusion protruding from its outer planar surface, and the shaft is elongated and protrudes from the top planar surface of the fan hub or the bottom surface of the fan base, an additional contact area between the shaft and the fan hub is provided when the extension portion of the shaft is enclosed by and in close connection with the extrusion of the fan hub. Thus, the connection strength between the shaft and the fan hub is greatly enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a cross-sectional view schematically showing a conventional fan motor structure.

[0009] FIG. 2 is a cross-sectional view schematically showing a fan motor structure according to an embodiment of the invention.

[0010] FIG. 3 is a comparison diagram contrasting the fan motor structure exhibited in FIG. 2 with a conventional fan motor structure.

[0011] FIG. 4 is a cross-sectional view schematically showing a fan motor structure according to another embodiment of the invention.

[0012] FIG. 5 is a comparison diagram contrasting the fan motor structure exhibited in FIG. 4 with a conventional fan motor structure.

[0013] FIG. 6 is a cross-sectional view showing a modification of the fan motor structure shown in FIG. 4.

[0014] FIG. 7 is a cross-sectional view showing a fan motor structure according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Referring to FIG. 2, according to an embodiment of the invention, a fan motor structure 10 includes a shaft 12 having a first end connected to a fan hub 14 and a second end fit into a bearing assembly 20. The bearing assembly 20 is mounted on a fan base 22 and includes a bearing 16 and a bearing seat 18 for accommodating and positioning the bearing 16.

[0016] In this embodiment, the fan hub 14 is formed with an extrusion 14a protruding from a top planar surface H of the fan hub 14 in its central location. The shaft 12 is also elongated to protrude upwards from the top planar surface H of the

fan hub 14 to form an extension portion with a length d in the axial direction of the fan motor structure 10. Thereby, the extension portion of the shaft 12 is enclosed by and in close connection with the extrusion 14a of the fan hub 14.

It should be understood that the extrusion 14a may be of any shape, such as a cup-shape shown in FIG. 2, as long as the extrusion 14a is in close connection with the extension portion of the shaft 12.

[0017] FIG. 3 is a comparison diagram contrasting the fan motor structure exhibited in FIG. 2 with a conventional fan motor structure.

[0018] The conventional fan motor structure is shown on the left-hand side of FIG. 3. According to the conventional design, since the bearing assembly 110, including the bearing 106 and the bearing seat 108, has a thickness of S_1 and needs to keep a predetermined distance S_2 from the fan hub 104 after assembly, it requires at least a space having a fixed length $S (=S_1+S_2)$ in the axial direction of the fan motor structure. Consequently, since the length S can not be further reduced, the length of the contact surface P in the axial direction must be shortened to meet the requirement of thinning the motor structure, thus decreasing the connection strength between the shaft and the fan hub.

[0019] On the other hand, the fan motor structure of this embodiment is shown on the right-hand side of FIG. 3. In this embodiment, however, since the shaft 12 protrudes from the top planar surface H of the fan hub 14 and the fan hub is formed with an extrusion 14a, when the extension portion of the shaft 12 is enclosed by and in close connection with the extrusion 14a of the fan hub 14, an additional length d of the shaft 12 is provided to enlarge the contact area and to increase the connection strength as a result. In other words, the protrusion of the shaft functions as a reinforced connection part E to greatly increase the connection strength between the shaft and the fan hub in the fan motor structure.

[0020] FIG. 4 is a cross-sectional view showing a fan motor structure 30 according to another embodiment of the invention. As shown in FIG. 4, the shaft 12 may also protrude downwards from the bottom surface of the fan base 22 to form an extension portion having a length d in the axial direction of the fan motor structure 30. FIG. 5 is a comparison diagram contrasting the fan motor structure exhibited in FIG. 4 with a conventional fan motor structure. Referring to the right-hand side of FIG. 5, according to this embodiment, since the shaft 12 protrudes downwards from the bottom surface of the fan base 22, the required space having a length S in the axial direction moves

downwards as the bearing assembly 20 is coupled to the downward extension portion of the shaft 12. Under these circumstances, the fan hub 14 is allowed to be formed with an extrusion 14a protruding from a bottom planar surface L of the fan hub 14 in its central location, without reducing the space required for the bearing assembly 20 after assembly. In other words, the downward protrusion of the shaft 12 makes it possible for the extrusion 14a to protrude from the bottom planar surface L of the fan hub 14, and, when the downward extrusion 14a is in close connection with the shaft 12, the contact area between the fan hub 14 and the shaft 12 is enlarged to increase the connection strength.

[0021] Referring to FIG. 6, there is shown a modification derived from the embodiment exhibited in FIG. 4, and the difference between them lies in that the fan hub 14 is formed with an extrusion 14a in its central location protruding from both the top planar surface H and the bottom planar surface L of the fan hub 14. Hence, the connection strength between the shaft 12 and the hub 14 can be further enhanced. Also, it is easy to understand from FIG. 6 that the extrusion 14a may, alternatively, protrude only from the top planar surface H.

[0022] Through the invention, since the fan hub is formed with an extrusion protruding from its outer planar surface, namely the top planar surface or the bottom planar surface, and the shaft is elongated and protrudes from the top planar surface of the fan hub or the bottom surface of the fan base, an additional contact area between the shaft and the fan hub is provided when the extension portion of the shaft is enclosed by and in close connection with the extrusion of the fan hub. Thus, the connection strength between the shaft and the fan hub is greatly enhanced.

[0023] FIG. 7 is a cross-sectional view showing a fan motor structure 40 according to another embodiment of the invention. The fan motor structure 40 shown in FIG. 7 includes a sleeve 24 such as a copper sleeve embedded between the shaft 12 and the fan hub 14, and the shaft 12 has one end protruding from the top planar surface of the fan hub 14 to form an extension portion. Hence, one can also provide additional contact area between the shaft 12 and the sleeve 24 by extending the sleeve 24 upwards to enclose the extension portion of the shaft 12 to enhance the connection strength. Also, referring back to FIG. 4 again, the downward extrusion 14a of the fan hub 14 may be replaced with a sleeve embedded between the shaft 12 and the fan hub 14, and one can provide additional contact area between the shaft 12 and the sleeve simply by extending the sleeve downwards to enhance the connection

strength between the shaft 12 and the fan hub 14.

[0024] It is clear to one of ordinary skill in the art that the extension portion of the shaft is not limited to being connected to the extrusion of the fan hub or the sleeve, but may be connected to other members of the fan motor structure capable of providing a tight connection.

[0025] While the invention has been described by way of examples and in terms of preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. On the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.